

Abstract

The regulation method detects the operating condition of the mobile telephone (10) via at least one operating parameter, with corresponding limitation of the transmission energy when the detected operating parameter indicates that the mobile telephone is being used in immediate proximity to the user. The number of time slots in which data can be transmitted is limited dependent on the detected operating parameter. An Independent claim for a mobile telephone with transmission energy regulation is also included.

The invention concerns a procedure for regulating the transmitting power with a portable radio terminal, in particular with a mobile telephone, and a such portable radio terminal.

Portable radio terminals can be used in different way for the change of data. They can be used like conventional telephones for the Sprachtelefonie in a space situation, into which them by the head, in particular by the ear, a user are held. With the delivery of electromagnetic radiation in the sending /Empfangsmodus always also a certain portion of the radiated electromagnetic radiation is in particular irradiated into the body, into the head, the portable radio terminal using person.

Around the measurement of radiated electromagnetic radiation to standardize a so-called SAR value was introduced. By SAR value one understands in each case a maximum value of the achievement absorbed determined in the near field of a portable radio terminal after certain defaults per gram of Körpermasse. For this to the European standard prEN 50361 (at present still in the draft status) is referred, where details are indicated to the SAR valuation. Limit values for the irradiated achievement (SAR value) depend also on the position at the body. For example the SAR value at the head is clearly smaller than at the wrist. Therefore the mobile telephone, if it is fastened to the wrist in styles of a wrist-watch, with higher achievement may send, as if it is held by the head. Changes of the limit values for individual parts of the body (head, trunk, joints) are to be expected also for the future.

Even if the effects of to inorganic fabric of delivered electromagnetic radiation are not yet finally investigated, it is required due to strongly increasing sensitivity in the population regarding electromagnetic radiation to meet measures in order to keep the delivery as small as possible electromagnetic radiation into the body of a user. In a body-far operating mode it is however less critical of delivering electromagnetic radiation with higher energy. A such operating mode is present for example, if the portable radio terminal at sufficient distance of the body of the user is operated, for example then if the portable radio terminal is operated by means of a free speech mechanism or if it is used not for the change of language information to separate in combination with a data-processing system or a PDA for the change of language data.

The WHERE 02/05443 a2 reveal to mobiles equipment, which is applicable in a wireless telecommunication system. With the equipment the transmitting power can be limited, if this

close at the human body is. A temporal delimitation of the transmitting power is not revealed however.

It is therefore a task of the available invention to make a procedure available for regulating the transmitting power with a portable radio terminal and an appropriate portable radio terminal whereby the transmitting power is adapted to the present operating condition.

This task is solved by a procedure for regulating the transmitting power with a portable radio terminal, in particular with a mobile telephone, comprehensively the steps:

- A) Seize the operating condition of the portable radio terminal on the basis at least one operating parameter, which suggests an enterprise in direct proximity to a user and/or the position at the body of the user and
- B) Rules transmitting power as a function of that at least seized operating parameters, whereby transmitting power to pre-determined upper limit value limited is, if operating parameters indicates that portable radio terminal in direct proximity to users, in particular to sensitive part of the body user, operated, whereby the number of time slots, in which data is sent, as a function of that is described at least operating parameter (α , R, S, T).

With the characteristics the managing task of solving portable radio terminal according to invention is dealt later.

On the basis at least the operating parameter can be determined by the procedure according to invention, in which operating condition the portable radio terminal at present is. It can be determined thus, whether it is used in a normal language telephone IE operating condition, in which the portable radio terminal in a headnear position, for example by the ear of a user, is held, or whether the portable radio terminal in a body-far position is operated, for example under utilization of the language telephone IE function by means of a free speech mechanism, in particular a Headsets, or as data unit of transmission in connection with an electronic data-processing system. If the portable radio terminal in a bodynear position is operated, for example in direct proximity to the cap of a user, then the transmitting power is limited to a pre-determined upper limit value, whereby also the transmitting power transferred to the head of a user is limited. This maximum transmitting power depends on the given SAR limit values for the respective position at the body. Thus the SAR limit value of a portable radio terminal can be kept, which works in the procedure according to invention.

If in the context of these documents of transmitting power the speech is, then with it the product of transmitting power and transmitting time is meant. In other words the transmitting power leaves itself by changing the present transmitting power, with which portable radio signals are sent radiation electromagnetic in the form of, and/or by variation of the transmitting time, over which the portable radio signals are sent, to affect. For the influence of the transmitting power simply an upper limit value is specified as a function of the seized operating parameter, which is then kept by transmission electronics. For the influence of the transmitting time it is possible to change the number of time slots used for sending. Both possibilities lead for itself or in combination to the attitude according to invention of the transmitting power.

In a further training of the invention it can be intended that that indicates at least operating parameter the space situation of the portable radio terminal. The space situation can give information on whether the portable radio terminal is held by the head of the user, whereby it

usually is in this condition in a situation wind-inclined related to a longitudinal axis by the portable radio terminal in the area. If the longitudinal axis of the portable radio terminal lies however horizontally in the area, then this points on the fact that the portable radio terminal on a horizontal surface, for example a table or such a thing lies, and not in direct proximity to the body of a user can be operated.

In a further training of the procedure according to invention it can be intended that that indicates at least operating parameters, whether the portable radio terminal at the body of the user, in particular at its head or its wrist, is carried. This can take place for example via the fact that that indicates at least operating parameters, whether a mechanical contact between the portable radio terminal and the skin of the user exists. By determination of the presence of a direct skin contact between the skin of a user and the portable radio terminal according to invention can be closed likewise on in which operating mode the portable radio terminal is operated, so that depending upon determined operating mode the transmitting power can be limited.

In a further training of the invention it can be intended that that indicates at least operating parameters, whether an accessory equipment, in particular a free speech mechanism or a data communication cable, are attached to the portable radio terminal. If an accessory equipment, for example a free speech mechanism or a data communication cable attached to the portable radio terminal, is then also this points on the fact that the portable radio terminal is not operated in direct body proximity to the user, so that a delimitation of the maximum transmitting power is not necessary.

Furthermore it can be intended according to invention that that indicates at least operating parameter the transmittal mode of the portable radio terminal. If it concerns with the portable radio terminal a terminal, with whatever apart from a normal speech transmission communication procedure, as for example procedures according to the HSCSD (High speed Circuit Switched DATA) - standard extension, which SMS (Short Message service) - standard extension or the GPRS (general pack radio service) - standard extension, to be accomplished can, then the portable radio terminal can seize the current operating condition depending upon kind of data communication. If the portable radio terminal is in the HSCSD move mode, SMS move mode or in the GPRS move mode, then this points on the fact that no language data are exchanged, but the fact that the portable radio terminal is used for the data exchange of languagestrange data and therefore in direct body proximity to the user is also not operated, so that a delimitation of the transmitting power for the reasons initially specified is not necessary.

Although it is possible to regulate the transmitting power on the basis only one that managing addressed operating parameters it can be intended in a further training of the invention that during collection of a majority these, weightings certain assigned by operating parameters different operating parameters with first are evaluated. By the consideration of a majority of operating parameters, whereby the operating parameters are differently weighted, the actually available present operating mode of the portable radio terminal with higher probability can be determined. For example the space situation of the portable radio terminal determining operating parameters can be less strongly weighted than the connection of an accessory equipment indicating operating parameters, since the portable radio terminal can be brought, even if it is held by the cap of the user, into any space situation. It is to be considered that a user can also telephone being or sitting also because of the cap to portable radio terminal held. Other operating parameters can have therefore stronger force of expression over the operating

mode of the portable radio terminal, i.e. the Sprachtelefonimodus with direct contact to the cap or data communication mode at sufficient distance of the user, selected at present.

Additionally the mobile telephone could inquire over an operating menu with the user whether the mode of operation and/or. the position was recognized correctly by the body. Alternatively it can be also according to invention intended that the user enters automatically the present operating condition over an operating menu.

For the regulation of the transmitting power it can be further intended that that is compared at least seized operating parameters with data stored first in a memory, whereby on the basis the result of comparison is decided whether the portable radio terminal in direct proximity is operated to a user. Regarding the upper limit value, to which the transmitting power can be limited, it can be intended according to invention that these with approximately 0.8 Watts or z. B. about 2 Watts is. Anyhow it should be so high straight that the SAR limit value is not crossed.

Furthermore according to invention it can be intended that the portable radio terminal of one contains communicating basis station of a portable radio net a signal with this, if the present transmitting power for a reliable data communication is not sufficient. The portable radio terminal can send an appropriate acoustic or visually recognizable signal to the user, with whom being informed of it that it should change the operating mode, for example by it a free speech mechanism used, instead of holding the portable radio terminal by its ear. By the change of the operating mode then the regulation switches the restriction of maximum value off, so that the portable radio terminal with higher transmitting **power can send**.

As initially suggested, the invention furthermore a portable radio terminal concerns described kind in particular for accomplishing the procedure that managing, comprehensively:

- at least one sensor for seizing at least the current operating condition of characterizing operating parameter,
- a transmission/receipt unit with a transmission signal amplifier and
- a rule unit for regulating the transmitting power of the transmission signal amplifier, whereby the rule unit heads for the transmission signal amplifier as a function of that at least seized operating parameters for the regulation of the transmitting power, whereby the number of time slots, in which data is sent, is limited as a function of that at least operating parameter (α , R, S, T).

For the collection at least operating parameter, different sensors can be intended, for example a space situation sensor, in particular an angle of inclination sensor, for the collection of the space situation of the portable radio terminal, a skin contact sensor, in particular a skin resistance sensor, for the collection of a mechanical contact between the portable radio terminal and the skin of the user, a connection sensor for the collection of an accessory equipment attached to the portable radio terminal, a transmittal mode collection sensor for the collection of the kind of the present transmission of data by means of the portable radio terminal or further sensors.

Furthermore a stretcher assistance condition sensor can be intended for the collection of a condition of a stretcher assistance for carrying the portable radio terminal at the body of a user. This is of advantage for example if the portable radio terminal can be carried in styles of a wrist-watch at the wrist of the user, whereby the sensor seizes whether the bracelet is closed

and regulates according to the transmitting power. Also the situation of the skin contact sensor can give information on the position. If the skin contact sensor on the equipment front (in the proximity of the loudspeaker) has contact, then one can assume the equipment is held by the head. If the sensor announces a contact on the back, then the portable radio terminal at the wrist is carried. Preferentially are intended a majority of such sensors in the portable radio terminal according to invention.

Furthermore it can be intended with the portable radio terminal according to invention that a memory is assigned to the rule unit, into which first reference values is stored, whereby the regulation of the transmitting power takes place as a function of a comparison of the reference values with that at least seized operating parameters.

The invention is exemplarily described in the following on the basis the enclosed figure.

Fig. 1 represents a schematized block diagram of invention-relevant components of a portable radio terminal.

In Fig. 1 is generally marked with 10 a portable radio terminal according to invention. This covers a majority of sensors 12, 14, 16, 18.

The sensor 12 serves for the collection the space situation of the portable radio of terminal 10 and is implemented as angle of inclination sensor. The sensor 12 seizes and spends over the line 20 an angle of inclination α , around which the longitudinal axis of the portable radio of terminal is bent relative to pre-defined Senkrechten in the area.

The sensor 14 is implemented as skin contact sensor, in particular skin resistance sensor, and spends over the line 22 a resistance value R , which lies close between two 26 electrodes 28, 30 connected with the sensor 14 by the lines 24.

The sensor 16 is implemented as connection sensor and spends over the line 32 a signal S , which indicates, whether into the socket contact 36 of the portable radio terminal 10 attached over the line 34 an accessory equipment is put or not, and which kind of accessory equipment it concerns for example around a free speech mechanism, a data communication cable, a battery charger or such a thing.

The sensor 18 is designed as transmittal mode collection sensor and spends over the line 38 a signal T , which indicates, in which move mode the portable radio terminal straight is. In other words the signal indicates T whether the portable radio terminal is in a normal language telephone IE mode or whether other data types over if necessary höherratige transmission methods, as for example HSCSD transmission methods or GPRS transmission method are exchanged.

As the dotted line 40 shows, still further sensors can be for the collection of further operating parameters available, as for example a sensor for the collection of a closing condition of a Verschlusschnalle of a bracelet attached at the portable radio terminal or a further skin contact sensor in another place of the portable radio terminal.

The seized operating parameters solid angle α , resistance R , connection parameter S and transmittal mode parameter T are transferred 38 to a rule unit 40 over the lines 20, 22, 32, which is trained as the evaluation of the operating parameters. Furthermore the rule unit 40 provided with a memory 42 is, into which reference values to the seized operating parameters

angles of inclination are alpha, resistance R, connection parameter S and transmittal mode parameter T stored and selectable.

In the rule unit 40 the seized operating parameters are weighted differently and it is determined by comparison with in the memory unit 42 the stored and out these selected reference values whether the portable radio terminal 10 in direct body and/or. Head proximity to a user is operated or whether it is operated in sufficient distance from the user or at which part of the body it is operated. If no clear allocation is possible, then the user can be asked over an operating menu for the position.

On basis of this determination over a line 44 a transmission signal amplifier 46 of a transmission/receipt unit 48 headed for to the delivery of portable radio signals 50 in the form of electromagnetic radiation over an antenna 52. If several antennas are present, then the suitable transmitting antenna can be selected also in dependence of the determined position. Depending upon control of the transmission/receipt unit over the line 44 on basis of the evaluated operating parameters the transmission signal amplifier 46 is regulated, so that if on the basis the weighted operating parameters it were determined that the portable radio terminal 10 in direct body proximity is operated to the user, who is limited to a pre-determined maximum value by the transmission signal amplifier 46 outgoing and over the antenna 52 radiated transmitting power. This can be communicated also to the basis station about the radio interface. It is otherwise determined that the portable radio terminal in a sufficiently large distance from the body of the user is operated, then the transmission signal amplifier 46 is headed for in such a manner that it can send unrestrictedly with full achievement, so that a more reliable data communication is ensured.

In this way the transmitting power can be regulated reliably, over the transmitting power as well as over the number of time ski TZE, in which one sends. One sends on twice as many time slots, then also the absorbed achievement doubles itself.

With the invention it is possible to operate depending upon kind of use of the portable radio terminal 10 this with different Sendeenergieen averaged (over the time) so that if the portable radio terminal in direct proximity of the user is operated, only small Sendeenergieen, for example up to 0,8 Watts in a time slot, becomes certified, whereas then, if the portable radio terminal 10 in sufficient distance from a user is operated, stronger Sendeenergieen becomes certified, for example up to 2 Watts and six time ski TZE.

Wishing case it can be intended that during the enterprise of the portable radio terminal a feedback will transfer 10 with small transmitting power from a basis station of the net communicating with the portable radio terminal to the portable radio terminal, which informs the user of it that the present transmitting power for a reliable signal transmission is not sufficient for basis station. If the user gets a such report visually or acoustically over the portable radio terminal communicated, then he can change the operating mode, by removing the portable radio terminal from the cap and language telephone IE makes a use under employment of a free speech mechanism, whereby higher middle Sendeenergieen becomes certified.

Reference symbol list

10 portable radio terminal

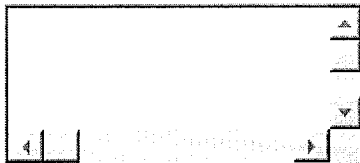
12 space situation layer

14 skin contact sensor

16 connection sensor

18 transmittal mode sensor
 20-26 lines
 28, 30 electrodes
 32, 34 lines
 36 socket contact
 38 line
 40 rule unit
 42 memory
 44 line
 46 transmission signal amplifiers
 48 transmission/receipt unit
 50 portable radio signal
 52 antenna

enen Ergebnisse anwendbar.



1. Method for regulating the transmitting power with a portable radio terminal (10), in particular with a mobile telephone, the comprising steps:

A) Seize the operating condition of the portable radio terminal (10) on the basis at least an operating parameter (alpha, R, S, T), which suggests an operation in close proximity to an user and

B) Rules of the transmitting power in response of that at least a detected operating parameter (alpha, R, S, T),

whereby the transmitting power is limited on a pre-determined upper limit, if the operating parameter (alpha, R, S, T) indicates that the portable radio terminal (10) in close proximity becomes an user operated, whereby the number of the time slots, in which data sent become, in response of that becomes at least an operating parameter (alpha, R, S, T) limited.

2. Process according to claim 1, characterised in that the current transmission power in response of that at least an operating parameter (alpha, R, S, T) limited becomes.

3. Process according to one of claims 1 to 2, characterised in that that at least operating parameter (alpha) the space situation of the portable radio terminal (10) indicates.

4. Method after one of the preceding claims, characterised in that that at least operating parameter (R) indicates whether the portable radio terminal (10) at the body an user, in particular at its head or wrist, carried becomes.

5. Process according to claim 4, characterised in that that at least operating parameter (R) indicates whether a mechanical contact between the portable radio terminal (10) and the skin of the user exists.

6. Method after one of the preceding claims, characterised in that that at least operating parameters (s) indicates whether an attachment, in particular a free speech mechanism or a data communication cable, connected to the portable radio terminal (10) are.
7. Method after one of the preceding claims, characterised in that that at least operating parameter (T) the transmittal mode of the portable radio terminal (10) indicates.
8. Methods after one of the preceding claims, characterised in that with detection of a plurality of operating parameters (alpha, R, S, T) different operating parameters (alpha, R, S, T) with this associated, weightings certain first evaluated become.
9. Method after one of the preceding claims, characterised in that that at least detected operating parameter (alpha, R, S, T) with first in a memory (42) stored data compared becomes, whereby on the basis the comparison result decided becomes whether the portable radio terminal (10) in close proximity becomes an user operated.
10. Process according to claim 10, characterised in that of the users over an operating menu the current operating state enters.
11. Process according to one of claims 2 to 10, characterised in that the upper limit of the transmission power with approximately 0.8 watts lies.
12. After methods one of the preceding claims, characterised in that portable radio terminal (10) with operation with limited transmission power a signal of a portable radio net receives, which indicates that the transmission power for a reliable data transmission is too small, and that the portable radio terminal in response of this signal spends a corresponding output to the user.
13. Portable radio terminal (10), comprising:
at least a sensor (12, 14, 16, 18) to seizing at least the current operating state of characterizing operating parameter (alpha, R, S, T)
a transmission/receiving unit (48) with a transmission signal amplifier (46) and
a control unit (40) to regulating the transmitting power of the transmission signal amplifier (46),
whereby the control unit (40) heads for the transmission signal amplifier (46) in response of that at least a detected operating parameter (alpha, R, S, T) to the control of the transmitting power, whereby the number of the time slots, in which data sent become, in response of that becomes at least an operating parameter (alpha, R, S, T) limited.
14. Portable radio terminal (10) according to claim 13, characterized by a space situation sensor (12), in particular an angle of inclination sensor (12), to the detection of the space situation (alpha) of the portable radio terminal (10).
15. Portable radio terminal (10) according to claim 13 or 14, characterized by a skin contact sensor (14), in particular a skin resistance sensor (14), to the detection of a mechanical contact between the portable radio terminal (10) and the skin of an user.
16. Portable radio terminal (10) after one of the claims 13 to 15, characterized by an inertial assistance state sensor to the detection of a state of an inertial assistance to supports of the portable radio terminal at the body of an user.

17. Portable radio terminal (10) after one of the claims 13 to 16, characterized attachment, in particular to the detection of a free speech mechanism or a data communication cable, connected by a connection sensor (16) to the detection one to the portable radio terminal (10).

18. Portable radio terminal (10) after one of the claims 13 to 17, characterized by a transmittal mode detecting sensor (18) to the detection of the type of a current transmission of data by means of the portable radio terminal (10).

19. Portable radio terminal after one of the claims 13 to 18, characterised in that of the control unit (40) a memory (42) associated is, into which first comparison values stored are, whereby the control of the transmitting power in response of a comparison of the comparison values with that at least a detected operating parameter (alpha, R, S, T) made.